

<p align="center">LLNL Environmental Restoration Division Standard Operating Procedure</p>	<p align="center">TITLE: Sampling Monitor Wells with Bladder and Electric Submersible Pumps</p>
<p>APPROVAL _____ Date _____</p> <p>Environmental Chemistry and Biology Group Leader</p>	<p align="center">PREPARERS: P. Daley, R. Goodrich, S. Gregory, and G. Howard</p> <p align="center">REVIEWERS: R. Brown*, T. Carlsen, E. Christofferson*, V. Dibley, J. Duarte, B. Failor*, J. Greci, B. Hoppes*, S. Kawaguchi, and B. Ward*</p>
<p>APPROVAL _____ Date _____</p> <p>Division Leader</p> <p>CONCURRENCE _____ Date _____</p> <p>QA Implementation Coordinator</p>	<p align="center">PROCEDURE NUMBER: ERD SOP-2.3</p> <p align="center">REVISION: 2</p> <p align="center">EFFECTIVE DATE: December 1, 1995</p> <p align="center">Page 1 of 6</p>

*Operations and Regulatory Affairs Division

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedure for sampling wells with bladder or electric submersible pumps. Its purpose is to ensure that ground water samples are obtained using a bladder or electric submersible pump in a credible, uniform, and well-documented manner. It assumes the well has been properly purged using SOP 2.1, "Presample Purging of Wells." A brief description of both types of pumps, and the installation of dedicated pumps, is given in SOP 2.8, "Installation of Dedicated Sampling Pumps."

2.0 APPLICABILITY

This SOP applies to all field personnel involved with the operation of dedicated and/or portable electric submersible and bladder pumps used during ground water sampling.

3.0 REFERENCES

- 3.1 deVera, E. R., B. P. Simmons, N. D. Stephen, and D. L. Storm (n.d.), *Samplers and Sampling Procedures for Hazardous Waste Streams*, U.S. EPA, Washington, D.C. (EPA-600/2-80-018).

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- 3.2 Ford, P. J., P. J. Tarina, and D. E. Seely (1984), *Characterization of Hazardous Waste Sites—A Methods Manual*, 302. Vol. II of *Available Sampling Methods*, 2nd ed., U.S. EPA, Washington, D.C. (EPA-600/4-84/076).
- 3.3 Korte, N. and D. Ealey (1983), *Procedures for Field Chemical Analyses of Water Samples*, U.S. Department of Energy, GJ/TMC-07, Technical Measurements Center, Grand Junction Project Office, Grand Junction, Colo.
- 3.4 Korte, N. and P. Kearl (1985), *Procedures for the Collection and Preservation of Groundwater and Surface Water Samples and for the Installation of Monitoring Wells*, Second Edition, U.S. Department of Energy, GJ/TMC-08, Technical Measurements Center, Grand Junction Projects Office, Grand Junction, Colo.
- 3.5 U.S. Department of the Interior (n.d.), *National Handbook of Recommended Methods for Water-Data Acquisition*, Washington, D.C.
- 3.6 U.S. EPA (1983), *Methods for Chemical Analysis of Water and Wastes*, Washington, D.C. (EPA-600/4-79-020).
- 3.7 U.S. EPA (1994), *Test Methods for Evaluation of Solid Waste*, Third Edition, Washington, D.C. (EPA-SW-846).
- 3.8 U.S. EPA (1985), *Practical Guide for Groundwater Sampling*, Washington, D.C., (EPA-600/2-85/104).
- 3.9 U.S. EPA (1986), *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*, Washington, D.C. (OSWER-9950.1).
- 3.10 U.S. EPA (1992) *RCRA Groundwater Monitoring: Draft Technical Guidance*, Washington, D.C. (EPA/530-R-93-001).

4.0 DEFINITIONS

4.1 Bladder Pump

Bladder pumps are used to evacuate low-yielding wells, which produce <1.0 gpm. A bladder pump, such as a Well Wizard is an enclosed cylindrical plastic or stainless steel tube containing a Teflon membrane bladder. Well water enters the bladder through a one-way check valve at the bottom. Compressed gas as is forced into the annular space between the tube causing the bladder, compressing the bladder, thus forcing the water up the discharge line and to the surface.

4.2 Electric Submersible Pump

The submersible pump is commonly used for purging high-volume, large-diameter wells that require high pumping rates. An electric submersible pump is a motor driven device that forces water to the surface through centrifugal action. This action is accomplished by impellers housed in a stainless steel cylindrical casing that propels water up the discharge pipe and to the surface. Some electric submersible pumps are controlled by a rheostat mechanism allowing better control and much lower discharge rates to be achieved.

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5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Field Personnel

The field personnel are responsible for the safe completion of evacuating and sampling ground water monitor wells according to guidelines set forth by this procedure and associated SOPs.

5.3 Field Support Personnel

The field support personnel's responsibilities are to provide the appropriate equipment, collection devices, and general field support to assure that field activities are performed in a timely and efficient manner. Field support personnel are also responsible for adhering to all applicable ERD SOPs.

5.4 Sampling Coordinator (SC)

The SC's responsibility is to supply a quarterly Routine Ground Water Sampling Schedule (also referred to as a Sampling Plan). In addition to providing an overall sampling plan, the SC has the option to provide a specific sample plan for each day (Daily Operations Guide). The technical information required for purging wells is also provided by the SC in the Well Specification Table.

6.0 PROCEDURES

6.1 Office Preparation

- 6.1.1 Prior to commencement of field activities, personnel shall review the appropriate Site Safety Plan, and all applicable SOPs and OSPs. Current copies of all appropriate documents shall be retained in the sample vehicle at all times.
- 6.1.2 Review all pertinent sampling information such as the quarterly Routine Sampling Schedule and Well Specification Table provided by the SC. The schedule contains the following information:
 - Well to be sampled.
 - Requested analysis.
 - Contract analytical laboratory to which samples are to be sent to for analyses.
 - Estimated amount of purge water to be collected, and where and how it will be treated.
- 6.1.3 Obtain appropriate data collection forms i.e., Chain-of-Custody (CoC) forms, Ground Water Sampling Logs (SOP 2.1, Attachment A), assigned field logbook, and any necessary shipping forms. Instructions for completing the logbook

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entries and field forms are provided in SOP 4.2, "Sampling Control and Documentation."

- 6.1.4 The number and type of sample containers needed for the sampling event should be obtained from the SC's supply (from Building 833 at Site 300 or directly from the SC). The SC should keep a sufficient stock of sample containers on hand and should be alerted by field personnel when the supply should be replenished by the contract analytical laboratory (CAL). The type of analysis for which a sample is being collected determines the type of bottle, preservative, holding time, and filtering requirement. See SOP 4.3, "Sample Containers and Preservation."
- 6.1.5 Check supplies (i.e., disposable 0.45 μ fiber filters, trip blanks, field blanks, plastic bags, etc.), and inform the SC when the supply level is low in order to maintain an adequate supply of sampling materials.
- 6.1.6 Field personnel should notify the SC when collecting interlaboratory collocated samples, so that arrangements can be made with the CAL courier for sample pickup. If necessary, the Livermore Site Ground Water Monitoring SC will request interlaboratory collocated samples daily.
- 6.1.7 The field personnel will notify the SC when collecting samples with short holding times (i.e., hexavalent chromium, fecal and total coliform). When samples are collected, the SC must inform the CAL ahead of time to allow for preparation.
- 6.1.8 The Administrative Escort Services must be given a 24-hour notice before work is scheduled in restricted areas. If appropriate, arrange access to sampling areas through Building Supervisors or the control point Operator per SOP 4.1, "General Instructions for Field Personnel."
- 6.1.9 Purge Water Collection

A. Livermore Site

The SC will provide a specific order of wells to be sampled, in order to efficiently coordinate placement of presample purge water collection tankers. Tankers and drums containing purge water may not be left at the well location and will be logged and disposed of according to SOP 4.7A, "Livermore Site Treatment and Disposal of Well Development and Well Purge Fluids."

B. Site 300

After consulting with the SC, the field support personnel must ensure that wells have sufficient collection drums available at the well head for purge water containment (SOP 4.7B, "Site 300 Treatment and Disposal of Well Development and Well Purge Fluids"). The quantity of purge water to be collected for each well is listed in the Routine Sampling Schedule.

6.2 Field Preparation

- 6.2.1 Routine maintenance of ground water monitoring wells and equipment such as generators and well-wizard controllers should be performed on a semi-annual basis as deemed by SOP 2.12, "Ground Water Monitor Well and Equipment Maintenance." Prior to usage in the field, assigned sampling personnel should check equipment for cleanliness, proper operation, and ensure that the batteries are charged and the fittings are secure. Use gloves when handling compressors and generators, and dispose of them immediately to avoid possible sample contamination.

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6.2.2 Compile all necessary equipment and instrumentation for sampling according to Attachment B, Equipment Checklist in SOP 2.1.

6.2.3 Fill out initial information on the Ground Water Sampling Log and Water Sampling Logbook per instructions in SOP 4.2.

6.2.4 Organize sampling route

A. Site 300

1. Complete an entire study area before beginning the next.
2. Sample all clean wells within a study area first.
3. Proceed to sample wells working from the least contaminated to the most contaminated.

B. Livermore Site

If necessary, the SC will specify the area and order of well sampling.

6.3 Operation

6.3.1 Once presample purging is complete according to SOP 2.1, sampling may begin. Wear a new pair of clean, surgical-type disposable gloves during sampling. According to SOP 2.2, "Field Measurements on Surface and Ground Waters," temperature, pH, and specific conductance should be measured immediately prior to sampling. Instruments should be calibrated according to SOP 4.8, "Calibration and Maintenance of Field Instruments Used in Measuring Parameters of Surface and Ground Water and Soils."

6.3.2 Monitor wells are sampled from the discharge tubing immediately after the final field measurements are taken (after presample purging). When sampling for the dissolved drinking water metals suite (DDWM) or specific dissolved metals (DMETALS), a disposable 0.45 μ fiber filter in a plastic housing can be inserted into the discharge tubing. If using a bladder pump, decrease the pump pressure so the pressure buildup on the filter does not blow out or rupture the filter. To measure field parameters, collect nonfiltered samples from the discharge tubing and place into a clean beaker.

6.3.3 The pump pressure rate may be adjusted by using the pump pressure knob on the bladder pump controller, the discharge knob on the Redi-Flo controller, or a valve on the discharge tee for submersible pumps. Refer to the operators manual.

6.3.4 Collect samples directly in containers as specified in SOP 4.3, "Sample Containers and Preservation." If sampling for volatile organic compounds (VOCs), refer to SOP 2.6, "Sampling for Volatile Organic Compounds." Fill the appropriate sample containers by allowing discharge to flow gently down the side of the bottle with minimal entry turbulence. The flow should not be violent, but the sample should be obtained in a timely manner (SOP 2.6). Do not allow the discharge tube to come in contact with the sample container.

6.3.5 Samples should be obtained in order of volatility; VOCs collected first, followed by semi-VOCs, radiologicals, and inorganics. All samples should be placed in Ziploc-type bags. VOCs should be placed on their sides in the coolers. The samples requiring preservation of 4°C should be cooled by using Blue ice packs in Zip-loc type bags or double-bagged ice cubes. Loose ice may be used when

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samples need to be rapidly cooled, but should be replaced with double-bagged or Blue ice before shipping.

- 6.3.6 Leave routine samples and proper documentation in the environmental sample lock-box for the primary analytical laboratory. Deliver non-routine and/or radiological samples to the SC for shipment and/or distribution to on-site laboratories. Ensure that the samples requiring refrigeration remain at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$, but do not allow them to freeze. Always ensure that proper chain of custody is maintained.

6.4 Post Field Operation

- 6.4.1 Before leaving the sampling location, cross check the samples collected with those requested by the SC, and/or note any discrepancies. To cross check refer to SOP 2.1, Attachment A.
- 6.4.2 Prior to sampling another site and to prevent cross contamination of equipment between locations, thoroughly decontaminate all equipment that is not dedicated according to SOP 4.5, "General Equipment Decontamination."
- 6.4.3 Complete the appropriate Ground Water Sampling Log and record sampling information in the designated Water Sampling Logbook (SOP 2.1 and SOP 4.2).
- 6.4.4 Verify that the CoC is appropriately completed per SOP 4.2. Indicate any special instructions in the Remarks Section of the CoC. Such instruction may include filtering and preserving the sample upon receipt. Also, for wells that are listed on the sampling plan as Clean Wells or for any well that is expected to be free of contamination write, "Verify any positive detections and call _____." The blank should be filled in with the appropriate QC Chemists name and phone number.
- 6.4.5 When appropriate, mark the sampling location and ID on a copy of the a site map. Mark the field location by driving a labeled stake wrapped with fluorescent marker tape adjacent to where the samples were collected. This stake is the reference point should the location need to be subsequently surveyed.

6.5 Office Post Operation

- 6.5.1. Deliver all field logbook notes, ground water sampling logs, and CoC forms weekly to the SC. Deliver or fax copies of completed CoCs daily to the SC.
- 6.5.2 The SC will retain a copy of the original forms (CoC, ground water sampling log), and provide the originals to the Data Management Group (DMG) for final archive. The DMG will provide copies of the forms to the appropriate Operations and Regulatory Affairs Division Analyst, as necessary.

7.0 QA RECORDS

- 7.1 LLNL Ground Water Sampling Log
- 7.2 Logbooks
- 7.3 Chain-of-Custody Forms

8.0 ATTACHMENTS

Not applicable.